What is claimed is:

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- 1 1. A method for determining component flow rates of a multiphase 2 fluid in a conduit, the fluid consisting of at least three known 3 components, the method comprising the steps of:
 - a) measuring at each of two different positions along the conduit at least four mixture quantities;
 - b) providing a speed of sound in each of the components at the measured pressures and temperatures;
 - c) providing a trial value for each of either the component flow rates or the phase fractions;
 - d) using a predetermined model to calculate values for the measured mixture quantities based on the trial values for each of either the component flow rates or the phase fractions;
 - e) using a predetermined error function to determine an error value; and
 - f) using a predetermined optimizing algorithm to determine whether the calculated values are acceptable, and, if they are not, to provide a new trial value for each of either the component flow rates or the phase fractions.
- 1 2. A method as in claim 1, wherein the error function is the sum
- of the squares of the difference between the measured and
- 3 calculated values at each point.
- 1 3. A method as in claim 1, wherein the four mixture quantities
- are the sound speed, the flow velocity of the multiphase fluid,
- 3 the pressure and the temperature.
 - 4. A method for determining component flow rates of a multiphase fluid in a conduit, the fluid consisting of at least three known

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components, the method comprising the steps of:

- g) measuring at each of two different positions along the conduit at least four mixture quantities;
- h) providing a speed of sound in each of the components at the measured pressures and temperatures;
- i) providing a trial value for each of either the component flow rates or the phase fractions;
- j) using a predetermined model to calculate values for the
 measured mixture quantities based on the trial values for
 each of either the component flow rates or the phase
 fractions;
 - k) using a predetermined error function to determine an error value; and
 - 1) using a predetermined optimizing algorithm to determine whether the calculated values are acceptable, and, if they are not, to provide a new trial value for each of either the component flow rates or the phase fractions.
 - 5. A method as in claim 1, wherein the error function is the sum of the squares of the difference between the measured and calculated values at each point.
 - 1 6. A method as in claim 1, wherein the four mixture quantities 2 are the sound speed, the flow velocity of the multiphase fluid,
 - 3 the pressure and the temperature.